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# Editorial Introduction

## Three longitudinal studies of children's development in Pittsburgh: the Developmental Trends Study, the Pittsburgh Youth Study, and the Pittsburgh Girls Study

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### Introduction

It is not common in longitudinal studies on child development to be able to trace the intellectual pedigree for one longitudinal study. The three Pittsburgh-based longitudinal studies that are the focus of this special issue have their intellectual ancestry both in the United States and in England. The US origin of the Developmental Trends Study, the Pittsburgh Youth Study and the Pittsburgh Girls Study can be found in the planning phase for the Oregon Youth Study, which Magda Stouthamer-Loeber and Rolf Loeber helped to set up under the guidance of Gerald R. Patterson and John B. Reid from 1979 to 1983. The European origin of the three Pittsburgh studies is the Cambridge Study in Delinquent Development, which David P. Farrington has spearheaded since 1982, and which was started by Donald West in 1961. The fact that David P. Farrington joined the investigative team in Pittsburgh has been of great benefit, encouragement and stimulation over the past 15 years.

One may wonder whether three longitudinal studies are not a bit much to undertake in one lifetime. Most longitudinal investigators are already glad to be able to undertake a single longitudinal study over decades. So, why three? Once Rolf and Magda Loeber had left Eugene in 1983, they and David Farrington decided to pool their strengths and create a longitudinal study, called the *Pittsburgh Youth Study*, based on a community sample of 1517 young

boys. Two features distinguished the study from its inception: a large sample and first measurements before adolescence (most longitudinal studies up to that date had not started until adolescence).

However, we realized then that such a community-based study would not necessarily inform much about the tail-end of the distribution of problem behaviour. For that reason, Rolf Loeber, prompted by Benjamin B. Lahey of Athens, Georgia, thought it prudent to start a smaller longitudinal study of clinic-referred boys ( $n = 177$ ), called the *Developmental Trends Study*. Both studies were eventually funded and started their first assessments in 1987.

Invariably, we were asked why we only studied boys in the subsequent years. Our consistent answer was that if we had studied girls as well and split the sample between boys and girls, we would have had less statistical power for either boys or girls to investigate relatively rare conditions, such as violence, and various combinations of co-occurring problem behaviours.

The idea of starting a study on girls, however, kept nagging us. After many discussions, in which we were joined by Kate Keenan from Chicago, we decided to put in a relatively small proposal to start a study of clinic-referred girls. However, the reviewers of the National Institute of Mental Health did not like our plan, and subtly suggested that the field would be better served by a large-scale community study. Thus, the *Pittsburgh Girls Study* was born, and its first assessment was started in 2000. By that year, we had become seasoned longitudinal researchers who had many opportunities to learn from past mistakes and successes. This meant that our approach to longitudinal data collection, data processing and analyses, alongside our thinking about developmental processes, had much evolved. We will highlight some of these aspects when we briefly describe the three studies.

### **The Developmental Trends Study (DTS)**

The Developmental Trends study is now in its fifteenth year, and has been supported by grants from the National Institute of Mental Health. The key features of the study are: 177 clinic-referred boys between ages seven and 12 were assessed yearly, multiple informants have been used, and a very high cooperation rate by its participants over many years has been accomplished. Initially, the boys included in the study had all been referred to mental health clinics, mostly for disruptive behaviour disorders, i.e. attention deficit-hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD).

The study has three aims: document the course of disruptive behaviour disorders over time, from ADHD to ODD and CD, and currently to antisocial personality disorder and psychopathy; examine the interaction over time between disruptive behaviour disorders and other, co-morbid disorders, such as anxiety disorders; and examine variables associated with the aetiology of disruptive behaviour in general and disruptive behaviour disorders in particular.

Of special interest are those variables that could account for certain boys becoming worse over time and others not.

DTS participants, their parents and teacher were interviewed on a near yearly basis (see design shown in Table 1). Unfortunately, because of funding restrictions in Year 5, only telephone contacts with the participants could be established. The annual assessments included psychiatric diagnoses, which allowed the study of the relationships of diagnoses over time as well as concurrently. Most importantly, the study's high cooperation rate despite the burdens of many repeated assessments (average 91.7%) has set new standards for longitudinal studies on maladjustment in childhood and adolescence.

To date the Developmental Trends Study has led to 31 peer-reviewed papers (not counting the two papers in the current issue). In addition, we have written numerous chapters and invited papers (see Appendix 1). A large share of the publications resulted from the enormous efforts and creativity by staff on the projects. In addition, we have been very fortunate to attract many scholars and students to analyse our data and publish the results. The DTS has also greatly benefited from the creativity of co-authors, of which we mention here the first authors of papers only: Jeffrey D. Burke, Mary Ann G. Christ, Paul J. Frick, Stephanie M. Green, Elizabeth L. Hart, Keith McBurnett, Judith L. Navratil, Linda Pfiffner, Amy Pruis, Mary F. Russo, Lauren S. Wakschlag, and Jason L. Walker.

### *Examples of key findings*

The study has produced many original findings, most of which have been summarized in Loeber et al. (2000). Some examples are:

- Support for the distinction between DSM-III-R ODD and CD in boys (Loeber et al., 1991; Lahey and Loeber, 1994), and that ODD is a developmental precursor to CD (Loeber et al., 1991; Lahey and Loeber, 1994). However, once symptoms are considered, there appears a developmental continuum between symptoms that only partly represents the respective symptoms of ODD and CD (Lahey and Loeber, 1994; Loeber et al., 1993; Russo et al., 1994).
- DSM-III-R ODD predicted CD over time, but ADHD did not predict CD once ODD was taken into account (Loeber et al., 1995; Lahey et al., 2000).
- Boys with an early age of onset of symptoms had a faster progression to more serious problems than boys whose problems emerged at a later age (Loeber et al., 1992).
- The prevalence of hyperactive-impulsive symptoms declined with increasing age, but symptoms of inattention did not (Hart et al., 1995).
- Physical fighting predicted the onset of CD more than any other specific CD symptom (Loeber et al., 1995).



- Cortisol was uniquely associated with aggressive rather than covert forms of CD (McBurnett et al., 1997).
- Maternal frequent smoking during pregnancy was significantly more likely to produce a child with CD (Wakschlag et al., 1997).
- The development of ODD to CD fits a life-span developmental model (Lahey and Loeber, 1994; Lahey et al., 1999).

Appendix 1 contains many other papers with original findings, which can be requested from Rolf Loeber.

### **The Pittsburgh Youth Study (PYS)**

This longitudinal study of a community sample of inner-city boys began in 1987 and is now in its fifteenth year (for the design, see Table 2). Funding for the PYS has come from the Office of Juvenile Justice and Delinquency Prevention (OJJDP), the National Institute of Mental Health, the National Institute of Drug Abuse, and the Pew Charitable Trusts. The aims of the study are to document the development of antisocial and delinquent behaviour from childhood to early adulthood, the risk factors that impinge on that development, and help seeking and service provision for boys' behaviour problems. In addition, the study focuses on boys' development of alcohol and drug use, and internalizing problems. The 1517 boys in the study had been selected from the first, fourth and seventh grades of Pittsburgh public schools (called the youngest, middle and oldest sample, respectively). After an initial screening (85% of the randomly selected families participated), the 30% most antisocial boys (based on parent, teacher and participant information) were included in the sample for follow-up, together with 30% randomly selected from the remainder. Just over half of the sample is African-American, and the remainder Caucasian. Over 90% lived with their natural mother (see Loeber et al., 1998 for details).

The youngest sample ( $n = 503$ ) has now been followed up a total of 18 times (from age seven to 20). The middle sample ( $n = 508$ ) was age 10 at the first assessment, and has been followed up seven times until age 13, but was then discontinued because of the overlap with the oldest sample. The boys in this sample are currently being assessed at age 22. The oldest sample ( $n = 506$ ) has been followed up 16 times (from age 13 to 25). In the last wave of data collection that is available for data analysis for the oldest sample (the 16th assessment), the cooperation rate of the participants (young men aged 24) was 83.0%. The average cooperation rate for that sample over 15 follow-ups was 89.5%. The last assessment of the youngest sample available for data analysis (the 18th assessment, age 20) yielded a participation rate of 83.3%. The average cooperation rate for that sample over 16 follow-ups was 82.3%.



Assessments were done initially half-yearly, and later yearly (see Table 2) and had the boys, their parents and teachers as informants. A large variety of measures were used, with several measures resulting from collaboration among investigators of the OJJDP Program of Research on the Causes and Correlates of Delinquency, consisting of the Denver Youth Survey (Principal Investigator: David Huizinga), the Rochester Youth Development Study (Principal Investigator: Terence P. Thornberry), and the Pittsburgh Youth Study.

The yield of the PYS has been much enhanced by the linkage of the main study to 21 independently funded substudies. We are much indebted to the following investigators of the substudies for their inspiration, efforts and skills in executing the substudies and producing papers on the results: Avshalom Caspi, Jacqueline Cohen, Hans Heiner, Timothy O. Ireland, Benjamin B. Lahey, Don Lynam, Terrie Moffitt, Herbert L. Needleman, Adrian Raine, N. Wim Slot, Terrence P. Thornberry, and Brendon Welsh (the remaining substudies have been initiated by ourselves, including David P. Farrington, Rolf Loeber, Magda Stouthamer-Loeber, Helene R. White).

To date, the Pittsburgh Youth Study has produced two books and 87 papers and 32 unpublished reports (not counting the three papers in the current issue). We are very grateful to the following colleagues, who contributed papers as first authors (in addition a multitude of co-authors made important contributions to the papers): Adrian Angold, Jennifer M. Beyers, Kathy Browning, Avshalom Caspi, Horatio Fabrega, Cecilia A. Hartman, David Huizinga, Oliver John, Kate Keenan, Barbara T. Kelley, Dacher Keltner, Robert F. Krueger, Benjamin B. Lahey, Alan J. Lizotte, Don Lynam, Eugene Maguin, Stephen C. Messer, Terrie Moffitt, Herbert L. Needleman, Faith Peeples, Richard W. Robins, Mary F. Russo, Caroline A. Smith, Terence P. Thornberry, Welmoet B. Van Kammen, Evelyn Wei, Jennifer L. White, Per-Olof Wikström, Eric Youngstrom, and Quan Zhang.

### *Examples of key findings*

The following are examples of key findings that have resulted so far from the PYS and its substudies:

- The higher the number of risk domains (i.e. in the child, family, school, etc.), the higher the probability of later serious delinquency; the lower the number of promotive domains, the lower that probability. Risk and promotive factors appear to cancel each other out in determining long-term risk of serious delinquency (Stouthamer-Loeber et al., 2002).
- The higher the neighbourhood disadvantage (as evident from census data), the more likely boys are exposed to risk factors and the less likely that they will be exposed to promotive factors (Stouthamer-Loeber et al., 2002).



- Delinquency was concentrated in some families: 5% of the families contained 30% of the offenders, and, more broadly, 12% of the families contained almost half (44%) of the offenders. These figures did not vary markedly by ethnicity (Farrington et al., 2001).
- The development from antisocial behaviours to serious delinquency best fitted a model of three incremental pathways: the Authority Conflict Pathway, the Overt Pathway, and the Covert Pathway (Loeber et al., 1993, 1999).
- In the oldest sample the prevalence of repeated violence between ages 13 and 20 was 14%, and it was almost twice as high in disadvantaged compared with advantaged neighbourhoods (17% vs. 10%; Beyers et al., 2001).
- Almost 2% of the boys in the middle and oldest samples were convicted of homicide (Loeber et al., in preparation).
- An early onset of offending prior to age 13 is more common in disadvantaged compared with other neighbourhoods. Also, disadvantaged neighbourhoods contain more late-onset offenders, which are particularly more common in public housing areas than in advantaged neighbourhoods (13% vs. 34%; Wikström and Loeber, 2000).
- In most cases delinquent attitudes predicted delinquency as well as the reverse. However, attitudes predicted delinquency better with advancing age (Zhang et al., 1997).
- Child–parent interactions tend to be stable, such as physical punishment, communication, supervision, positive parenting, and bad parent–child relationship qualities. However, physical punishment decreased, while poor supervision and low-level positive parenting increased. In contrast, poor communication and a disadvantaged relationship between the parent and child did not materially change between ages 6 and 18 (Loeber, Drinkwater et al., 2000).
- Over time, changes in alcohol consumption, compared with changes in marijuana use, was a much stronger predictor of changes in violence (White et al., 1999).

This small sample of findings does not do justice to the great variety of research papers that have resulted from the PYS. The reader is referred to Appendix 1 for these studies.

### **The Pittsburgh Girls Study**

The Pittsburgh Girls Study (PGS) is a community-wide longitudinal study of young girls in the city of Pittsburgh. Current funding for the study is provided by National Institute of Mental Health, National Institute on Drug Abuse, and the Office of Juvenile Justice and Delinquency Prevention. The PGS

focuses on the development of conduct disorders and delinquency in a large inner-city, community sample of preadolescent girls. The study also investigates co-occurring problematic disorders, such as depression, somatization problems, and substance use. In addition, the study collects information about service delivery and help seeking by parents and teachers for girls' problem behaviours. Further, the study investigates a wide range of risk and protective factors that may influence the course of girls' problem behaviours over time.

To identify eligible girls, we undertook in 1999–2000 a community-wide survey of households in 90 neighbourhoods of the city of Pittsburgh. From this survey of 103 238 households, we identified 3241 girls aged between five and eight years (disadvantaged neighbourhoods have been oversampled). When we recontacted the initial sample, 85.3% of the eligible girls and their families agreed to participate in the longitudinal study, resulting in a final sample size of 2451. The study utilizes multiple informants: the children, their primary caregiver and their teacher are all being interviewed independently on an annual basis. Data collection for the first study phase began in the autumn of 2000 and was successfully completed in August 2001 (Table 3). Currently, the girls, their parents and teachers are participating in the second assessment when the girls are aged 6–9 years. At this stage, a 99.9% cooperation rate has been achieved. We anticipate continuing the study at least until the girls have gone through adolescence, but this goal depends on future funding. The paper presented in this issue is the first of many papers we hope to publish on this study.

### **Barriers to executing the longitudinal studies and ways we overcame them**

There are four major barriers we faced over the years. First, we had to obtain a large amount of funds for each of the studies. We have been fortunate to successfully compete in national competitions for funds over so many years. We have been especially fortunate with the grant monitors from each of the funding agencies, who have given us much advice and assistance over the years.

The second challenge to longitudinal studies is to engage participants and convince them to continue to participate. This task has become much more challenging over the years in the DTS and the PYS as participants fanned out over the globe. The high retention rate in the two studies is a tribute to the participants and the staff members who were able to find them and convince them to continue with the assessments.

A third barrier to overcome was our ability to deal with the very large amounts of data that we collected over years. For example, since the spring of 1987 when data collection started in the PYS, over 50 000 assessments have been completed. There are currently 21 885 documented constructs. With the constructs and raw data loaded, the system currently maintains 72 million data items of variables and constructs, which, miraculously, are accessible for analyses with great ease.



And, last but not least, it has been a great challenge to conduct the research while maintaining continuity in staffing. Overall, this has been achieved, and we are grateful to the dedication and long-term efforts of many staff members who have contributed to the studies and continue to do so.

## Prospects

The current issue celebrates the insights possible from the data of the three studies and illustrates innovative approaches. Looking back over the past 15 years, we can marvel at the variety of issues that have been addressed. As a result of these collective efforts, the Pittsburgh longitudinal studies represent a substantial accumulation of knowledge on children's development to early adulthood that goes way beyond what we had envisaged when we started the studies, and way beyond what we could have achieved on our own. At the same time, the data sets hold promise for future analyses and studies. It is up to us and to our colleagues to address them.

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## **Appendix 1: Publications resulting from the Developmental Trends Study, the Pittsburgh Youth Study and the Pittsburgh Girls Study, arranged by topics**

### *Books*

- Stouthamer-Loeber M, Van Kammen WB (1995) *Data Collection and Management: A Practical Guide*. Newbury Park, CA: Sage.
- Loeber R, Farrington DP, Stouthamer-Loeber M, Van Kammen WB (1998) *Antisocial Behavior and Mental Health Problems: Explanatory Factors in Childhood and Adolescence*. Mahwah, NJ: Lawrence Erlbaum.

### General overviews

- Loeber R, Farrington DP, Stouthamer-Loeber M, Moffitt TE, Caspi A (1998) The development of male offending: key findings from the first decade of the Pittsburgh Youth Study. *Studies on Crime and Crime Prevention* 7: 141–172.
- Browning K, Loeber R (Feb., 1999) Highlights of Findings from the Pittsburgh Youth Study. OJJDP Fact Sheet No. 95.
- Loeber R, Green SM, Lahey BB, Frick PJ, McBurnett K (2000) Findings on disruptive behavior disorders from the first decade of the Developmental Trends Study. *Clinical Child and Family Psychology Review* 3: 37–60.
- Loeber R, Farrington DP, Stouthamer-Loeber M, Moffitt TE, Caspi A, Lynam D (2001) Male mental health problems, psychopathy and personality traits: key findings from the first fourteen years of the Pittsburgh Youth Study. *Clinical Child and Family Psychology Review* 4: 273–297.
- Loeber R, Farrington DP, Stouthamer-Loeber M, Moffitt TE, Caspi A, White HR, Wei EH, Beyers JM (in press) The development of male offending: key findings from 14 years of the Pittsburgh Youth Study. In Thornberry TP, Krohn M, eds. *Taking Stock of Delinquency*. New York: Kluwer/Plenum.

**Please note that the following papers are listed in only one category, even though they may fit under several topics**

### Academic achievement

- Frick PJ, Kamphaus RW, Lahey BB, Loeber R, Christ MA, Hart EL, Tannenbaum LE (1991) Academic underachievement and the disruptive behavior disorders. *Journal of Consulting and Clinical Psychology* 59: 289–294.
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- Maguin E, Loeber R (1996) How well do ratings of academic performance by mothers and their sons correspond to grades, achievement test scores, and teachers' ratings? *Journal of Behavioral Education* 6: 405–425.

### Anxiety, depression and internalizing problems

- Pruis A, Lahey BB, Thyer BA, Christ MAG, Loeber R, Stouthamer-Loeber M (1990) Separation anxiety disorder and overanxious disorder: how do they differ? *Phobia Practice and Research Journal* 3: 51–59.
- Walker JL, Lahey BB, Russo MF, Frick PJ, Christ MA, McBurnett K, Loeber R, Stouthamer-Loeber M, Green S (1991) Anxiety, inhibition, and conduct disorder in children, I: Relations to social impairment and sensation seeking. *Journal of the American Academy of Child and Adolescent Psychiatry* 30: 187–191.

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### *Biological factors*

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### *Child abuse*

- Stouthamer-Loeber M, Loeber R, Homish D-L, Wei E (2001) Maltreatment of boys and the development of disruptive and delinquent behavior. *Development and Psychopathology* 13: 941–955.

### *Comorbidities*

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